

Virginia Electric and Power Company**Surry Power Station
5570 Hog Island Road
Surry, Virginia 23883**

March 4, 1998

U. S. Nuclear Regulatory Commission
Document Control Desk
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SPS:JCS
Docket No.: 50-280
License No.: DPR-32

Dear Sirs:

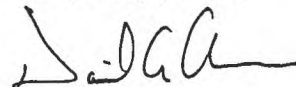
Pursuant to 10 CFR 50.73, Virginia Electric and Power Company hereby submits the following Licensee Event Report applicable to Surry Power Station Unit 1.

REPORT NUMBER

50-280/1998-002-00

This report has been reviewed by the Station Nuclear Safety and Operating Committee and will be forwarded to the Management Safety Review Committee for its review.

Very truly yours,

D. A. Christian
Site Vice President

Enclosure

Commitments contained in this letter: Complete Cat I RCE 98-0280 and implement necessary recommendations to prevent recurrence.

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9803100232 980304
PDR ADOCK 05000280
S PDR

copy: U. S. Nuclear Regulatory Commission
Region II
Atlanta Federal Center
61 Forsyth Street, SW, Suite 23T85
Atlanta, Georgia 30303

Mr. R. A. Musser
NRC Senior Resident Inspector
Surry Power Station

CATEGORY 1

REGULATORY INFORMATION DISTRIBUTION SYSTEM (RIDS)

ACCESSION NBR: 9803100232 DOC. DATE: 98/03/04 NOTARIZED: NO DOCKET #
FACIL: 50-280 Surry Power Station, Unit 1, Virginia Electric & Power 05000280
AUTH. NAME AUTHOR AFFILIATION
CHRISTIAN, D.A. Virginia Power (Virginia Electric & Power Co.)
RECIP. NAME RECIPIENT AFFILIATION
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SUBJECT: **Forwards** LER 98-002-00, per 10CFR50.73. Rept has been reviewed
by station nuclear safety & operating committee. Commitment
made by util, listed.

DISTRIBUTION CODE: IE22T COPIES RECEIVED: LTR 1 ENCL 1 SIZE: 2+5
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LICENSEE EVENT REPORT (LER)

(See reverse for required number of digits/characters for each block)

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS MANDATORY INFORMATION COLLECTION REQUEST: 50.0 HRS. REPORTED LESSONS LEARNED ARE INCORPORATED INTO THE LICENSING PROCESS AND FED BACK TO INDUSTRY. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (T-8-F33), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555-0001, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

FACILITY NAME (1) SURRY POWER STATION , Unit 1										DOCKET NUMBER (2) 05000 - 280		PAGE (3) 1 OF 5	
TITLE (4) Turbine-Generator Trip Due to Loss of Generator Excitation Power Results in Reactor Trip													
EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)				
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAME			DOCUMENT NUMBER	
02	02	98	1998	002	00	03	04	98	FACILITY NAME			DOCUMENT NUMBER	
OPERATING MODE (9) N													
THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)													
POWER LEVEL (10) 100 %													
			20.2201(b)			20.2203(a)(2)(v)			50.73(a)(2)(i)			50.73(a)(2)(viii)	
			20.2203(a)(1)			20.2203(a)(3)(i)			50.73(a)(2)(ii)			50.73(a)(2)(x)	
			20.2203(a)(2)(i)			20.2203(a)(3)(ii)			50.73(a)(2)(iii)			73.71	
			20.2203(a)(2)(ii)			20.2203(a)(4)			x 50.73(a)(2)(iv)			OTHER	
			20.2203(a)(2)(iii)			50.36(c)(1)			50.73(a)(2)(v)			Specify in Abstract below	
			20.2203(a)(2)(iv)			50.36(c)(2)			50.73(a)(2)(vii)			or in NRC Form 366A	
LICENSEE CONTACT FOR THIS LER (12)													
NAME D. A. Christian, Site Vice President										TELEPHONE NUMBER (Include Area Code) (757) 365-2000			
COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)													
CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS		CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS			
X	TL	RG	W893	Y									
SUPPLEMENTAL REPORT EXPECTED (14)													
YES (If yes, complete EXPECTED SUBMISSION DATE).					X	NO		EXPECTED SUBMISSION DATE		MONTH	DAY	YEAR	
ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) (16)													
<p>On February 2, 1998, at 0526 hours, with Surry Unit 1 at 100% reactor power and 855 Mwe, an 'Excitation Loss Of Power' annunciator was received followed immediately by a 'Generator Differential Lockout Relay Trip' annunciator. This caused an automatic trip of the Unit 1 main generator followed by an automatic turbine trip. The automatic turbine trip resulted in an automatic reactor trip.</p> <p>The most probable cause of the loss of generator excitation power was a degraded generator voltage regulator sub-component failure. At the time of the trip the generator voltage regulator was in the manual base adjust position due to a malfunction in the automatic circuit. Extensive testing of the voltage regulator circuitry and its sub-components did not result in the identification of a specific failed component. A root cause evaluation has been initiated to determine the cause of the Loss of Field and Main Generator Lockout annunciators, evaluate corrective actions from previous events, and provide recommended corrective actions to prevent recurrence.</p> <p>No conditions adverse to safety resulted from this event and the health and safety of the public were not affected. This event is being reported pursuant to 10 CFR 50.73(a)(2)(iv).</p>													

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

FACILITY NAME (1) Surry Power Station, Unit 1	DOCKET 05000 - 280	LER NUMBER (6)			PAGE (3) 2 OF 5
		YEAR 1998	SEQUENTIAL NUMBER 002	REVISION NUMBER 00	

TEXT (If more space is required, use additional copies of NRC Form 366A) (17)

1.0 DESCRIPTION OF THE EVENT

At 0526 hours on February 2, 1998 with Unit 1 at 100% reactor power and 855 MWe, a 'Excitation Loss of Power' annunciator [EIS-TL-ANN] was received followed immediately by a 'Generator Differential Lockout Relay Trip' annunciator [EIS-TB-ANN]. This caused the Unit 1 main generator [EIS-TB-GEN] and turbine [EIS-TA-TRB] to automatically trip. The automatic turbine trip resulted in an automatic reactor trip.

At the time of the trip, the generator voltage regulator [EIS-TL-RG] was in the manual base adjust position due to a malfunction in the automatic circuit. The automatic circuit malfunctioned in June 1997 and the regulator was placed in base adjust at that time. The decision was made to remain in base adjust and not repair the automatic circuit while on line. A review of industry events identified numerous occurrences of plant trips when attempts were made to repair voltage regulators on line.

Approximately one minute prior to the trip, the Unit 1 operator made an adjustment to the main generator base voltage switch [EIS-TL-EIS] to lower the 230 KV bus voltage from 233 KV to 230 KV. Response to the adjustment appeared to be normal to the operator.

Approximately 10 seconds after making the adjustment, a computer alarm indicated generator voltage was low at 20.8 KV. The operator acknowledged the alarm and proceeded to the generator control panel to check the voltage. He noted the generator voltage was 17 to 18 KV. The generator voltage appeared to be moving slightly up and down. As the operator started to announce that the generator voltage was extremely low, annunciators 'Excitation Loss of Power' (KLF Relay) and 'Generator Differential Lockout Relay Trip' (86-G Relay) actuated. This caused the Unit 1 main generator and then the turbine to automatically trip. The automatic turbine trip resulted in an automatic reactor trip.

Upon the receipt of the trip signal, the Reactor Protection System (RPS) actuated as designed and the operator backed-up the automatic trip with a manual trip. Both Motor Driven Auxiliary Feedwater (MDAFW) pumps [EIS-BA-P] and the Turbine Driven Auxiliary Feedwater (TDAFW) pump [EIS-BA-P] automatically started as designed on low-low steam generator (SG) level. Approximately 15 hours after the trip, annunciator 'NIS Source Range Hi Flux' [EIS-IG-ANN] was received and it was noted that detector N-31 had increased from 250 counts per second (cps) to 2000 cps. The appropriate annunciator procedure was entered. Redundant indications on detector N-32 and the gammametrics source range detectors showed no indications of an increased count rate.

A four hour non-emergency report was made to the NRC Operations Center at 0814 hours in accordance with 10CFR50.72(b)(2)(ii) due to a manual or automatic engineered safety feature (ESF) actuation.

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Troubleshooting was performed by the system engineer and station electricians on the generator base adjust control switch and the voltage regulator motor operated potentiometer for base adjust. No problems were found and the readings were correct for these switches. Additionally, the KLF and 86-G relays were tested satisfactorily. On February 3, 1998, a vendor representative with the assistance of system engineering and electricians performed tests of the voltage regulator circuits using vendor test equipment. All the circuits again tested satisfactorily.

The automatic circuit was tested. An intermittent relay was identified and the relay and relay socket were replaced. This was believed to have been the original problem that required operating in base adjust.

No equipment failures were found during any of the tests that would have caused the step decrease in excitation which caused the Unit trip. A root cause evaluation has been initiated to determine the cause of the Loss of Field and Main Generator Lockout annunciators, evaluate corrective actions from previous events, and provide recommended corrective actions to prevent recurrence.

On February 4, 1998, a final test which involved making voltage adjustments in automatic and manual modes was performed. The results of the test were satisfactory. Unit 1 was taken critical at 0507 hours on February 4, 1998, and returned to 100% power at 0530 on February 5, 1998. The unit is now operating with the regulator in the automatic mode.

This report is being made pursuant to 10CFR50.73(a)(2)(iv), due to the initiation of an engineered safety feature (ESF), including the reactor protection system (RPS).

2.0 SAFETY CONSEQUENCES AND IMPLICATIONS

Upon the receipt of the reactor trip signal, the RPS actuated and functioned as designed. The control rods inserted into the core and neutron flux was verified to be decreasing. Station operating personnel acted promptly to place the unit in a safe, hot shutdown condition in accordance with the proper procedures. The shutdown margin was calculated using the appropriate procedure and the critical safety function status trees were monitored to verify that unit conditions were acceptable. Plant response was as expected and the unit stabilized at hot shutdown. No conditions adverse to safety resulted from this event and the health and safety of the public were not effected.

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3.0 CAUSE

Although no specific component failure was identified during the troubleshooting of the regulator, the most probable cause of the loss of generator excitation power was a degraded generator voltage regulator sub-component failure. At the time of the trip the generator voltage regulator was in the manual base adjust position due to a malfunction in the automatic circuit. The automatic circuit malfunctioned in June 1997 and the regulator was placed in base adjust at that time.

Although testing by plant personnel and the vendor representative did not identify any problems with the regulator manual circuitry, a sub-component failure of this equipment remains as the most probable cause for the event. A root cause evaluation (RCE) has been initiated to determine the cause of the equipment failure.

4.0 IMMEDIATE CORRECTIVE ACTIONS

Following the reactor trip, Control Room Operators acted promptly to place the plant in a safe hot shutdown condition in accordance with emergency and other operating procedures.

The Shift Technical Advisor calculated the shutdown margin and monitored the critical safety function status trees to verify that the unit conditions were acceptable. Plant response was as expected and the unit was stabilized at hot shutdown.

5.0 ADDITIONAL CORRECTIVE ACTIONS

A root cause evaluation has been initiated to determine the cause of the Loss of Field and Main Generator Lockout annunciators, evaluate corrective actions from previous events, and provide recommended corrective actions to prevent recurrence.

A vendor representative with the assistance of system engineering and electricians began troubleshooting the voltage regulator circuits using vendor test equipment. The circuits tested satisfactorily. The base adjust switch in the main control room was checked for binding or sticking. No problem was found with the switch. The firing drawers and redundant circuits were tested individually and as a unit with no problems identified.

The automatic circuit was tested. An intermittent relay was identified and the relay and relay socket were replaced. This was determined to be the original problem that required operating in base adjust.

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A work order was submitted to troubleshoot and repair the N-31 source range detector condition. The high voltage power supply was replaced and this corrected the problem. The detector was satisfactorily tested and returned to service.

6.0 ACTIONS TO PREVENT RECURRENCE

Recommendations from RCE 98-0280 necessary to prevent recurrence will be implemented when the evaluation is completed.

7.0 SIMILAR EVENTS

LER 50-281/93-004-00, "Unit 2 Turbine-Generator Trip Via the Loss of Field Relay." The trip was caused by a loss of excitation field for the main generator. Troubleshooting of the voltage regulator identified a failed phase shifter card was discovered and replaced.

8.0 ADDITIONAL INFORMATION

Unit 2 was not affected by this event and remained stable at 100% power.